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EFFECTS OF COMPUTER-BASED IMMEDIATE FEEDBACK ON FOREIGN LANGUAGE LISTENING COMPREHENSION AND TEST-ASSOCIATED ANXIETY^{1,2}

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Summary.—This study investigated the effects of immediate feedback on computer-based foreign language listening comprehension tests and on intrapersonal test-associated anxiety in 72 English major college students at a Taiwanese University. Foreign language listening comprehension of computer-based tests designed by MOODLE,³ a dynamic e-learning environment, with or without immediate feedback together with the State-Trait Anxiety Inventory (STAI) were tested and repeated after one week. The analysis indicated that immediate feedback during testing caused significantly higher anxiety and resulted in significantly higher listening scores than in the control group, which had no feedback. However, repeated feedback did not affect the test anxiety and listening scores. Computer-based immediate feedback did not lower debilitating effects of anxiety but enhanced students' intrapersonal eustress-like anxiety and probably improved their attention during listening tests. Computer-based tests with immediate feedback might help foreign language learners to increase attention in foreign language listening comprehension.

Foreign language anxiety has been defined as the feeling of tension and apprehension specially associated with foreign language contexts, including speaking, listening, writing, reading, and learning (MacIntyre & Gardner, 1994; Cheng, 2004). Numerous studies have reported that anxiety can be regarded as one of the significant variables which influences language performance in the foreign language classroom (Horwitz, Horwitz, & Cope, 1986; Phillips, 1992; Aida, 1994; Matsuda & Gobel, 2004; In'nami, 2006; Liu, 2006). Some studies have indicated that anxiety generates an adverse effect on foreign language performance (Fletcher, 1997;

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³Moodle System is free software which is available at <http://moodle.org/>, and GNU General Public License can be found at <http://www.gnu.org/copyleft/gpl.html>.

Hancock, 2001; Cheng, 2004). Foreign language anxiety has also been reported as a negative factor in studies which showed that anxiety decreases achievement (Chastain, 1975; Backman, 1976; Tucker, 1976; Young, 1986; MacIntyre & Gardner, 1989). MacIntyre and Gardner (1994) specifically pointed out that students' anxiety was affected by course grades and standardized proficiency tests. In contrast, several studies have suggested that anxiety may be a positive motivating factor in second language acquisition and academic achievement, and regarded as "facilitating anxiety" (Alpert & Haber, 1960; Kleinmann, 1977). Facilitative anxiety can be defined as "eustress" (Selye, 1976), a type of stress that helps focus attention (Fevre, Matheny, & Gregory, 2003). How feedback raises eustress or distress remains a critical and controversial issue in foreign language learning and whether it should be minimized or actively used.

Many learners may have experienced foreign language learning anxiety with respect to language skills such as speaking (Young, 1990; Woodrow, 2006) or writing (Young, 1990; Cheng, 2002; Cheng, 2004; Woodrow, 2006). Speaking and writing are treated as productive skills. In contrast, only a few studies have been conducted on foreign language listening anxiety (Bekleyen, 2009). Listening is treated in foreign language acquisition as a receptive skill and can be affected by raised anxiety, especially during testing (Elkhafaifi, 2005).

Whether test anxiety facilitates or decreases performance on listening tests remains controversial. Some studies have concluded that test anxiety does not influence performance (MacIntyre & Gardner, 1989; Aida, 1994; In'nami, 2006). However, other research indicates that students' anxiety decreases performance on listening tests. For example, Elkhafaifi (2005) reported that higher listening anxiety resulted in lower listening comprehension grades. In contrast, increased anxiety can be regarded as a facilitative factor to learning (Chang, 2010). Chang indicated that by providing extensive listening instruction, students' listening performance improved, although this instructional approach resulted in higher anxiety scores (Chang, 2010). Based on interviews with some well-established scholars, it was pointed out that anxiety can possibly be seen as a positive aspect to language learning but more empirical studies are needed to investigate how language anxiety relates to listening performance (Young, 1992). Little research has been conducted on the effects of intrapersonal test-associated anxiety on listening comprehension achievement. Intrapersonal feedback during testing may be applied to enhance students' attention in foreign language listening and, hence, transform test-associated anxiety to a facilitative attribute and increase performance in listening tests.

Computer-assisted listening testing has often been used in foreign language instruction. Immediate interaction using computers can be eas-

ily achieved via software design and therefore immediate and specific feedback during language testing is a viable tool. Computer-based tests increase the scorability of listening tests and provide immediate scores. If a more advanced form of this testing can automatically select follow-up instructions, with questions and feedback being based on the learners' immediate response, it can become an important tool for personalized foreign language testing and learning. However, it is still unclear whether receiving immediate feedback during such tests will affect testing scores and intrapersonal test-associated anxiety.

In the current study, computer-based immediate feedback was designed to inform students immediately of their performance in a listening comprehension computer-based test. It is unknown whether computer-based immediate feedback in a listening comprehension computer-based test will cause more or less intrapersonal anxiety or whether it will lead to better or worse performance. It was hypothesized that immediate feedback might enhance the intrapersonal anxiety and foreign language listening test scores in the experimental group, as compared to the control group.

METHOD

Participants

Participants were all English major sophomores at a university in Taiwan. Eighty English majors were recruited, but eight students did not complete the data collection procedure. The final sample consisted of 72 students (59 women, 13 men). The average age of participants was 20 yr. (Table 1). With prior agreement, students' listening test scores from a listening placement test were used as pre-test scores. The scores of the re-placement test ranged from 0 to 100. This study was approved by the Medical Research Ethics Committee of Asia University.

Measures

Anxiety.—Three general types of anxiety have been identified in the context of foreign language research: state anxiety, trait anxiety (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983), and situation-specific anxiety (MacIntyre & Gardner, 1994). The aim of this study was to investigate test anxiety (state anxiety) and trait anxiety. Therefore, the Spielberger State-Trait Anxiety Inventory (STAI) was adopted. This has often been used as a research instrument for the study of anxiety in adults. The State-Trait Anxiety Inventory (Chung & Long, 1984; Chinese version with authors' permission) is a self-report rating scale designed to measure state and trait anxiety. Only the State subscale was used in this study. STAI state anxiety has been defined as the transient, moment-to-moment experience of emotional reaction to the current situation (Spielberger, *et al.*, 1983). A higher STAI state score indicates a greater state anxiety.

Language.—The style of computer-based listening comprehension is similar to the Test of English as a Foreign Language (TOEFL) administered by the Educational Testing Service (ETS) of Princeton, New Jersey. The English listening test contains 45 multiple-choice questions in three sections. Each section consists of 15 questions. The difficulty level of the examination was designed within a smaller scope of the General English Proficiency Test (GEPT) intermediate level, which is commonly adopted in Taiwan. GEPT intermediate level is equivalent to a paper-based TOEFL score of 500. The level of difficulty was suitable for the participants and listening Tests 1 and 2 had the same difficulty. The computer-based listening comprehension examination was programmed in MOODLE (Modular Object-Oriented Dynamic Learning Environment) and designed and managed by a colleague from the Department of Electrical Engineering.

MOODLE is an open source software package (under the GNU Public License) for producing Internet-based courses and web sites. The open source software of Apache HTTP Server and MySQL Server provides stable, reliable, and efficient web service and data management for our system. In our experiment, a PC Server with Intel® Pentium® D CPU 2.80GHz and 1G RAM allowed several hundred users to be tested on-line simultaneously. Therefore, we developed a new on-line accessible computer-based listening comprehension examination with immediate feedback based on the course management.

In the examination management, the Quiz+ module of MOODLE was programmed to pop up either (a) immediate feedback stating the user had a poor average score (“Your score is below the average”) or (b) non-meaningful signs during testing. Non-meaningful signs were presented to the control group at the end of a total of three sections. In contrast, computer-based immediate feedback about having a poor average score was applied at the end of the first section (after the 15th question), second section (after the 30th question), and the third section (after the 45th question) immediately after students in the experimental group had completed each section. Possible total scores for each section were 100.

The functions of Grade and User Login and Tracking in the course management of MOODLE were reused. The User Login and Tracking function recorded the full answering time and all answers in each user’s code. The Grade function provided automatic grading of the listening examination and automatic scoring for the STAI.

Procedure

The two computer-based tests were required for all students. The State-Trait Anxiety Inventory (STAI) and computer-based system with immediate feedback were completely described to all participants who signed a written informed consent before participation. The double blind

experimental design, including randomly dividing the control and experimental groups, was coded by student ID number. Half of the students, who were blindly coded by their student ID number and were designated as the experimental group, received computer-based immediate feedback. The other half of the students, also coded by their student ID number, did not receive immediate feedback and served as the control group.

All students were asked to take computer-based listening comprehension examinations twice in a listening classroom. The listening classroom, with personal computers, was designed as a noise-free classroom. The whole listening comprehension examinations were not subject to human-made or noise interruption. The room temperature of the classroom was maintained at 27°C to avoid environmental temperature-related discomfort.

The procedure for the experimental design is shown in Fig. 1. One STAI Trait anxiety, two STAI State anxiety, and two listening tests were given during a three-week period at the end of the semester. Students were tested on the STAI Trait anxiety in a computer classroom during the first week. After one week, all students took the computer-based listening comprehension examination (Test 1) with non-meaningful signs in

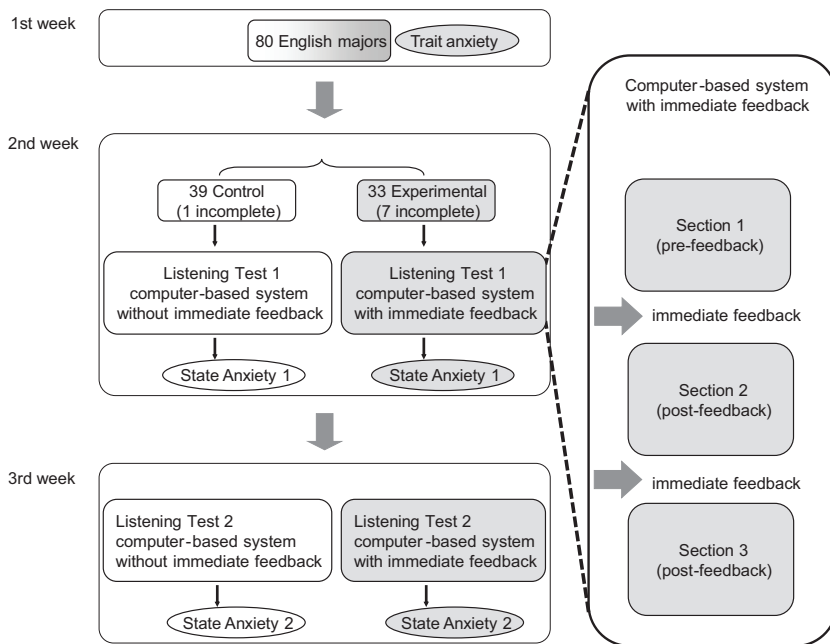


Fig. 1. Experimental design

the control group or with computer-based immediate feedback in the experimental group. Following the examination, the STAI was administered (State Anxiety 1). In the third week, the same procedure (Test 2 and State Anxiety 2) was conducted again with the same participants in the control and experimental groups, respectively.

At the end of the experiment, students were informed of the results of these two tests and that the grades they had achieved would not influence their final grades. Also, the meaning of the immediate feedback they experienced was explained to students. And once again, they were informed that they could withdraw from participation after the experiment. Seventy-two students completed all parts of the study without delay or missing data.

Statistical Analysis

Differences in average age, STAI scores, and pre-test scores between control and experimental groups were tested by unpaired Student *t* tests. Differences in the percentage of female participants between control and experimental groups were tested by the chi-squared test. The STAI scores and foreign language listening test scores were analyzed by analysis of variance (ANOVA) along with *post hoc* analysis in a one between (control and experimental) and two within (pre-feedback vs post-feedback and Test 1 vs Test 2) design. Intrapersonal differences between pre-feedback vs. post-feedback were subsequently tested separately as repeated measures in control versus experimental groups. Intrapersonal differences between Test 1 and Test 2 were subsequently tested separately as repeated measures in control and experimental groups. In all cases, a difference at $p < .05$ was considered statistically significant.

RESULTS

Age, trait anxiety, and mean entry scores were not significantly different between the control group and the experimental group (Table 1). In order to compare intra-group anxiety and test scores, pre-feedback score of foreign language listening comprehension (1st section), post-feedback score of foreign language listening comprehension (2nd or 3rd section), and state anxiety between the control group and the experimental group were compared, as shown in Table 1. Test 1 showed that pre-feedback test scores of foreign language listening comprehension (1st section) between the control group and the experimental group were similar whereas the post-feedback test scores (2nd or 3rd section) significantly ($p < .05$) increased in the experimental group. At the same time, the state anxiety scores after Test 1 were also significantly higher in the experimental group than in the control group (Table 1).

One week later, Test 2 showed that pre-feedback test scores and post-

TABLE 1
ANXIETY AND LISTENING SCORES BEFORE AND AFTER FEEDBACK

	Control (n = 39)		Experimental (n = 33)		p	Cohen's d
	7 M/32 W		6 M/27 W			
	M	SD	M	SD		
Sex ratio (Men/Women)						
Age	20.0	0.6	20.0	0.7	.98	
Pre-test						
Trait Anxiety	47.0	7.3	47.2	6.8	.93	
Pre-test Scores	54.6	13.1	56.2	13.8	.63	
Test 1						
Pre-feedback Score (1st)	57.7	18.3	55.4	18.9	.60	
Post-feedback Score(2nd)	56.0	14.2	62.8	15.0	.05*	0.45
Post-feedback Score(3rd)	55.5	13.9	61.7	16.0	.05*	0.40
State Anxiety ^a	51.3	10.6	58.6	12.0	.008†	0.63
Test 2						
Pre-feedback Score(1st)	54.8	17.2	54.2	18.5	.88	
Post-feedback Score(2nd)	49.9	11.7	52.3	15.6	.46	
Post-feedback Score(3rd)	50.7	13.1	51.5	16.7	.67	
State Anxiety ^a	49.2	10.3	50.0	9.3	.73	

Note.—Comparisons between groups were *t* tests with *df* = 1; significant differences between the control group and the experimental group at **p* < .05 or †*p* < .01. ^aThere was a significant difference in state anxiety means between Test 1 and Test 2 in the experimental group, *p* < .01.

feedback test scores between the control group and the experimental group were not significantly different (Table 1). In Test 2, the state anxiety scores were not enhanced by immediate feedback, as in Test 1 in the experimental group (Table 1). In the control group, the state anxiety scores in Test 2 were similar to Test 1.

To compare intra-personal differences in foreign language listening scores, pre-feedback scores and post-feedback scores of individual data in Test 1 and Test 2 were tested by *post hoc* repeated measures and are shown in Fig. 2. In the experimental group, intra-personal differences from pre-feedback scores (1st section) to post-feedback (2nd section) in Test 1 were significantly increased, but not in the control group (Fig. 2). This finding indicates that immediate feedback significantly improved intra-personal score in the foreign language listening test.

In order to compare intra-personal differences and intra-group differences in state anxiety between Test 1 and Test 2, individuals' STAI scores from Test 1 to Test 2 in the control group and the experimental group, respectively, were compared by *post hoc* repeated measures and are shown in Fig. 3. Individual STAI scores in Test 2 were lower than those in Test 1 in both the control group and the experimental group (Fig. 3). Furthermore, when analyzing intra-group differences between Test 1 and Test 2 anxiety,

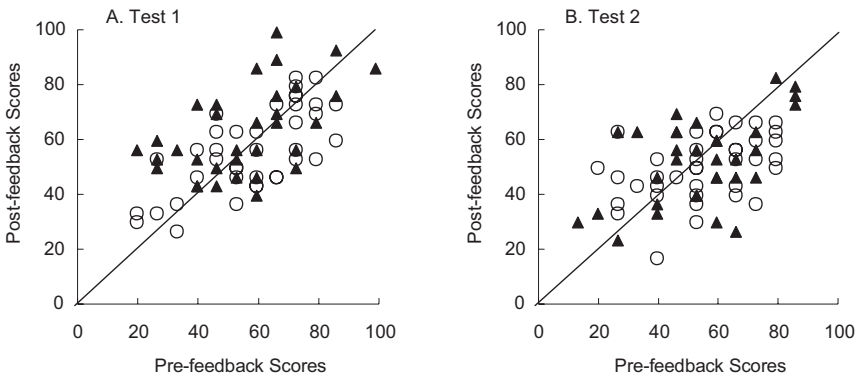


FIG. 2. Identity plot shows pre-feedback versus post-feedback scores in listening comprehension test of individual students in the control group (Cont., \circ) and the experimental group (Exp., \blacktriangle). The solid line represents the line of identity. Symbols falling above the line of identity represent scores increased following computer-based feedback, whereas symbols falling below the line of identity represent scores decreased following feedback. Difference observed between pre-feedback versus post-feedback scores for Test 1 experimental group only, $p < .05$.

giving immediate feedback, the mean STAI State anxiety scores on Test 2 were significantly lower than in Test 1 in the experimental group (Table 1). These intra-personal and intra-group findings suggest that repeated immediate feedback in Test 2 did not enhance state anxiety as it did in Test 1.

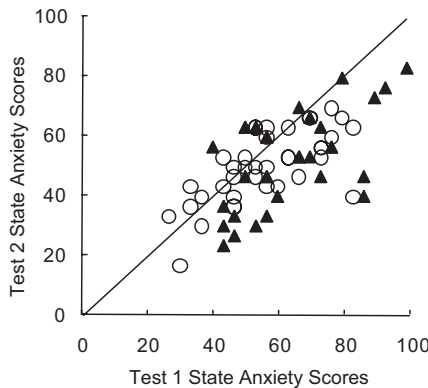


FIG. 3. Test 1 state anxiety versus Test 2 state anxiety of individual students in the control group (Cont., \circ) and experimental group (Exp., \blacktriangle). The solid line represents the line of identity. Symbols falling above the line of identity represent scores increased following second test, whereas symbols falling below the line of identity represent scores decreased following Test 2. Significant difference between Test 1 versus Test 2 observed in both groups, $p < .01$

The lack of increase in STAI state anxiety might explain why repeated immediate feedback after one week did not improve foreign language listening comprehension on Test 2.

DISCUSSION

The major findings conclude that unexpected computer-based immediate feedback raised intra-personal anxiety, but no debilitating effect was detected; in fact, an advantageous effect was observed on foreign language listening performance. However, recurrent similar feedback did not change students' anxiety and did not affect students' listening performance.

In the current study, computer-based feedback which implied peer competition ("You are below the average") appears to have led to better listening performance. The observation focuses on intra-personal differences in individuals while most previous studies have focused on inter-group differences. A previous study has shown that test anxiety was considered to have a negative effect on foreign language listening performance (Elkhafaifi, 2005). The principal findings show that immediate feedback can cause stress and increase EFL learners' attention to listening comprehension and thus refine their listening performance.

Stress can be classified into two types, "eustress" and "distress," to differentiate between "good" and "bad" stress (Selye, 1976). Eustress is a kind of short-term stress that provides immediate strength or focus. Learning with eustress was reported to not only provide people with more focus and attention, but also to help people think quickly and clearly (Fevre, *et al.*, 2003). The findings of the present study may imply that the use of a computer-based immediate feedback system might help students focus on the listening test, re-orient their attention to the test, or respond more accurately to the questions.

The eustress-like anxiety in this study suggested that the anxiety associated with feedback was facilitative to foreign language listening performance and did not hinder test-taking abilities but kept learners motivated to succeed or to be more attentive in test taking, as suggested by Alpert and Haber (1960) and Kleinmann (1977). However, when the students were repeatedly exposed to similar materials, students' state anxiety decreased in both groups, more obviously in the experimental group (Fig. 3). When the students were repeatedly exposed to similar immediate feedback, they likely became less motivated to provide accurate responses and hence their listening performance was not affected in Test 2. This result suggests that repetition of similar learning materials and processes may lead to students' loss of learning motivation or attention. This may also be explained by the Yerkes-Dodson law (Yerkes & Dodson, 1908), which

indicates that negative effects such as amotivation or inattention can be caused by too much arousal. A previous study pointed out that higher anxiety is indicative of the learner's higher motivation (Zhang, 2000). This study implies that lower anxiety would result in lower motivation. Consequently, facilitative anxiety might not be induced by repeated exposure to similar materials or the same feedback. It remains questionable whether computer-based adjustable feedback given during listening tests can keep inducing students' facilitative anxiety and help focus their attention during testing.

There are some limitations in the current study. Firstly, the participants were English majors (EFL students) and at a homogeneous proficiency level. For non-English majors, different anxiety reactions might have been generated. Secondly, feedback-induced anxiety and feedback-associated listening performance may only function better for students who have higher motivation to obtain better grades. Thirdly, since 82% of the participants were women and 100% were young students, it is still unclear whether sex differences or age differences will be observed in the relations between anxiety and listening scores.

For research purposes, the randomly selected experimental group was administered invariant feedback. Future studies are required to look into the effectiveness of intelligent and flexible computer-based feedback systems on the improvement of students' listening comprehension. The effects of a computer-based immediate feedback system or an immediate intelligent interaction system for foreign language listening comprehension still remains open for further research and discussion in the context of e-learning. Crafting specific feedback may help to keep attention and motivation high while giving specific discrimination cues to aid learning the correct answers. An immediate feedback system or immediate intelligent interaction system for foreign language listening comprehension may further help overcome the traditional foreign language listening pedagogy in the classroom where immediate interaction or feedback can hardly be conducted by one instructor. A computer-based testing system may help develop elaborate listening behavior.

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